THE CONTRIBUTIONS OF SURGERY TO A BETTER UNDERSTANDING OF GASTRIC AND DUODENAL ULCER.*

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CONTRIBUTIONS of surgery to our knowledge of ulcer of the stomach and duodenum are numerous and of high value, and, taken in conjunction with the recent work in experimental physiology of the digestive system, are throwing much needed light upon this obscure malady. In the past we have depended upon notoriously defective clinical examinations, supplemented by chemical and biological investigations of the gastric contents. These methods, while teaching some truths, often failed to demonstrate the actual condition present. Neither did post-mortem revelations give a clear picture of the situation during the curable period on account of secondary complications and terminal infections.

It is the purpose of this paper to examine the subject from the standpoint of the operating-room results, with a view of somewhat modifying the generally accepted opinions.

Ulcers of the stomach and duodenum can be divided surgically into two classes. First, the indurated or callousd ulcer, which can be seen and felt during operation, on account of the cicatricial tissue which gives the appearance and "feel" of a scar from the outside of the stomach wall. All the positive advances in surgical knowledge concern this group.

The second class has for its type the non-indurated mucous ulcer, which cannot be identified from the outside of the stomach or duodenal wall. The site of the ulcer does not betray its presence by thickening or other sign, and it is usually with much difficulty that it can be located even if the stomach and duodenum be opened and careful search made of the mucous

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membrane. We have on several occasions resorted to direct operative inspection when bleeding has been an important symptom, and have not always found it easy to discover the small mucous fissure which was responsible for the trouble.

Nearly all the failures of surgery are to be found in this group of so-called clinical or medical ulcers; because, (*a*) the ulcer is not located and many times its existence is problematical; (*b*) the condition is often confused with pyloric spasm, atonic dilatation, gastroptosis and the gastric neuroses, or other morbid non-surgical conditions; (*c*) the ulcer does not give rise to mechanical interference with the progress of food, which would introduce an operative indication.

The value of surgical contributions to our understanding of non-indurated ulcer is negative rather than positive in character and consists in teaching us errors in diagnosis and pointing out lines of future progress.

Location of Indurated Ulcer.—The relative frequency of ulcer has been placed at about 10 gastric to 1 duodenal. In St. Mary's Hospital between July 24, 1905, and March 23, 1907, 200 cases of ulcer were operated upon. Of this number 87 involved the stomach, 98 the duodenum and 15 were independent ulcers of each viscus; showing that ulcers which can be actually recognized are fully as often found in the duodenum as in the stomach. How can this apparent discrepancy between the older statistics and these facts be explained? The terminal three-fourths of an inch of the pyloric end of the stomach, the so-called canal of Jonnesco, does not take part in the grinding function of the antrum and is to be considered with the pyloric apparatus. It is therefore less exposed to the acid gastric contents and to mechanical injury.

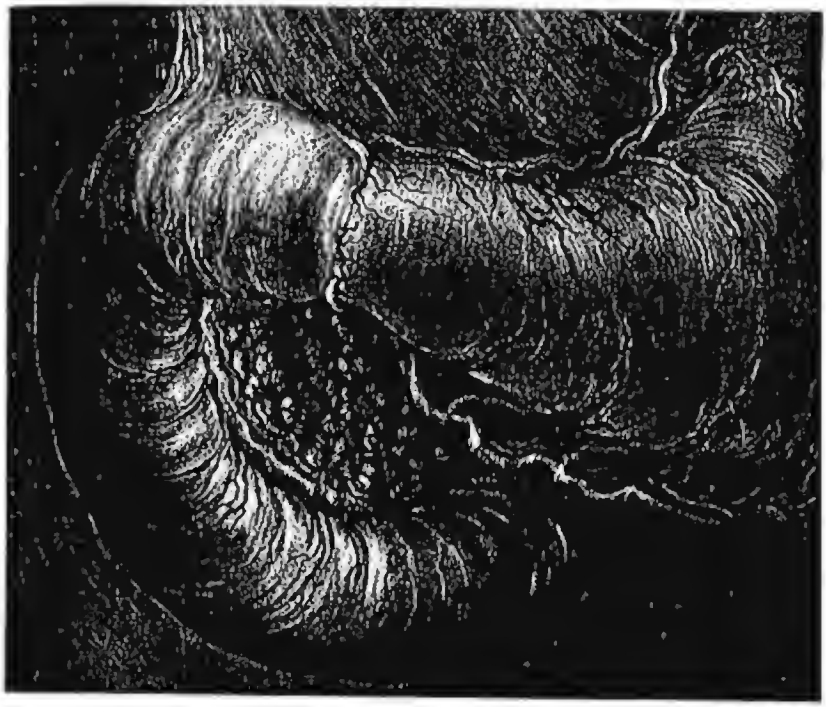
Ulceration of this canal is uncommon. The large majority of gastric ulcers involve the lesser curvature above the pylorus and extend downward anteriorly and posteriorly in a manner which we have compared to a *saddle*. Frequently an anterior and posterior ulcer thus exist connected across the lesser curvature by a bridge of cicatricial tissue. The posterior ulcer as a rule is the more extensive.

The typical duodenal ulcer is to be found in the upper inch and a half of the duodenum, and in 96 per cent. of the cases extends up to or within three-fourths of an inch of the pylorie sphincter. The deepest part of the ulcer will usually be found just below the pylorus, where the acid chyme, which is ejected with considerable force from the stomach, produces an impact upon the intestinal mucous membrane.

The fact that the ulcer extends up to and often involves the pylorie sphincter on the duodenal side, has led to the erroneous belief that the ulcer was pylorie, therefore gastric, and the statistics have been compiled on this mistaken identification. In the presence of an ulcer and with the parts more or less fixed by adhesions, it is often a difficult matter to actually determine the location of the pylorus. The best means of identifying it consists in the arrangement of the blood vessels, which is quite striking. A thick-walled vein is to be seen extending from the inferior margin of the pylorus on the gastric side, upward and across about three-fourths of its extent. From the superior margin a similar vein extends downward until it nearly or quite meets the one from below (Fig. 1). There are several variations from this which are shown in Fig. 2.

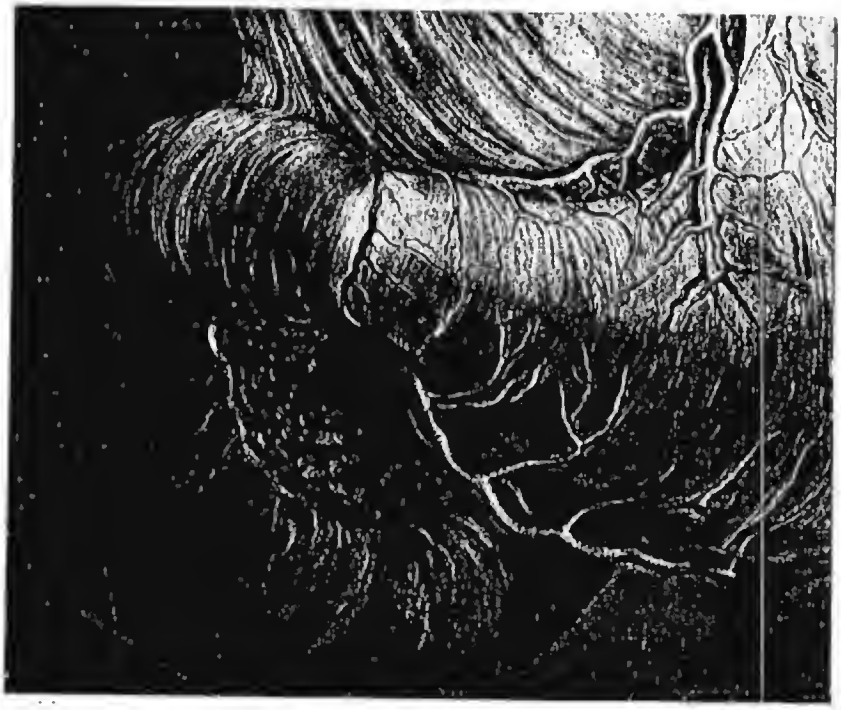
Relative Frequency of Indurated Ulcer in Male and Female.—It has been accepted as a fact that ulcer of the stomach, including the unidentified ulcer of the duodenum, is more common in woman than in man. Osler quotes the large statistics of Welsh and others, showing that 60 per cent. are to be found in women. The Fenwicks, on the contrary, give the proportion as nearly 80 per cent. in men. In Seymour Taylor's collection of 100 cases, he found 72 per cent. in men. In the operating room we found that 62 men were operated upon for gastric and duodenal ulcer to 38 women. On analyzing this percentage, however, it is to be noted that duodenal ulcer is found 77 times in men and 23 times in women, while in true gastric ulcer the percentage runs nearly even—52 men to 48 women; so that the percentage of male over female is due to the peculiar frequency of the duodenal ulcer in the male, and it is worthy of note that the percentage of gall-stone

FIG. 1.



Showing relations of blood vessels about pyloric end of stomach and duodenum, with special reference to pyloric vein.

FIG. 2.



Location of pylorus by means of the blood vessels. Pyloric vein.

disease is 76 per cent. in women to 24 in men, the reverse of the statistics just given for duodenal ulcer.

The duodenal ulcer occurs well above the common duct with its alkaline secretions. The curve of the duodenum in men is usually higher than in women; that is, the first portion of the duodenum in men is nearly always ascending, while in women it is often transverse. It seems probable that, for mechanical reasons, the alkaline secretions of the liver and pancreas more readily neutralize the acid chyme in the upper duodenum in women than in men.

Relation of Indurated Ulcer to Cancer.—In 54 per cent. of the cases of cancer of the stomach submitted to resection in 69 cases operated upon in 1905 and 1906, by Dr. Charles H. Mayo and myself, the clinical histories and pathological examination of removed specimens made it certain that the cancer had its origin in ulcer. Fütterer has demonstrated the development of malignant disease in portions of the gastric mucosa which had become separated and buried in scar tissue. The thick mucous membrane of the stomach, with its deep rugæ, is particularly subject to chronic irritation. In 80 per cent. of the cases the cancer had its origin in the pyloric end of the stomach, where the mucous surface is exposed to trauma, although the antrum has but one-sixth the total area of the gastric mucous membrane. The topography of ulcer and cancer are therefore the same.

We have seen but 3 cases of primary carcinoma of the duodenum. In one of these it seemed certain that the malignant disease had its origin in ulcer. In the second it was possible, and in the third the extent of the disease did not permit of a sufficiently thorough examination upon which to base an opinion.

Cancer of the duodenum is a rare malady, and its etiological relationship to ulcer is apparently not important. Five times, however, we have found cancer of the stomach developing upon the margin of a duodenal ulcer which had extended up to and invaded the pylorus, showing the susceptibility of the stomach to carcinoma as contrasted with the duodenum.

It is possible that the surgical conception of the frequency of gastric cancer developing upon ulcer exceeds the facts, as in a considerable percentage of our gastric resections for cancer the operation was begun with the belief that the disease was simple ulcer, and on exploration cancer was found engrafted upon it. The patient who has suffered long from ulcer is more willing perhaps to submit to operation at an early date than are those who have not previously been afflicted with gastric disorder. That cancer frequently develops upon an ulcer base, however, must be admitted.

Non-indurated Mucous Ulcer.—The important advances which have been brought out through surgical inspection of actual diseased conditions during life, which we have been considering, are based entirely on the fact that there is an ulcer present; that it is indurated; that about it there is a scar and other evidences which are so tangible that there can be no question that the disease actually exists. We now come to study a second class, in which the lesion is not demonstrated and the evidence that it exists is based upon notoriously defective clinical examinations. The lesion is supposed to be mucous, and therefore not to involve those external gastric and duodenal envelopes which would lead to accurate identification. The operation is undertaken upon an unproved hypothesis, and the results of the application of surgery to such indefinite condition throws still further doubt upon their actual existence.

That an *acute* non-indurated mucous ulcer does exist cannot be questioned. Evidence furnished by direct surgical inspection, by the operative repair of acute perforations, and by operations for acute hæmorrhage, demonstrate the fact which has been further attested to by post-mortem investigations of deaths from such acute conditions. Does there exist *chronic* non-indurated mucous ulcer, or is the belief in such a condition based upon our knowledge of acute ulcer and the inability to find chronic ulcer clinically diagnosticated? The whole subject is so interwoven with fact and fancy that at the present time it is nearly impossible to secure reliable data with which to lay bare the truth.

In contrasting the two groups, we find that *chronic indurated ulcer* as a rule produces certain phenomena. In the early stages there may be no mechanical symptoms, the distress being occasioned by the food and excessively acid gastric secretions passing over the sensitive ulcerated surface. In the course of time partial healing and development of large amounts of cicatricial tissue about the ulcer base lead to more or less interference with the progress of food, and if this amounts to retention the character of the symptoms change and become characteristic of obstruction. Evidences of blood are helpful, but not essential to diagnosis.

Chronic non-indurated mucous ulcer, if it exists, is certainly indefinite in its symptomatology. Pain, gas, distress after eating and moderate stagnation of food, with pyloric spasm, constitute the accepted chain of evidence. The nature of the supposed lesion does not lead to the formation of scar tissue, and, as a matter of fact, the symptoms are not only vague, but they are equally characteristic of non-surgical conditions. The actual demonstration of blood, in our opinion, is necessary to even give the evidence sufficient standing in court.

Of all misleading symptoms, pyloric spasm is the most mysterious. The term is given to an intermittent pathological contraction of the pylorus and antrum. Some authors seem to consider it a definite entity having a pathology of its own; the large majority of observers, however, look upon it as a symptom. The interesting and important question is, does it indicate ulcer?

In our experience, pyloric spasm is not regularly seen in indurated ulcer, but is an habitual accompaniment of certain other morbid conditions.

The derivatives of the primitive fore-gut consist of the posterior wall of the pharynx, the whole of the œsophagus, the stomach and duodenum to a point just below the common duct, the liver and pancreas being offshoots from that part of the fore-gut which is to become the upper duodenum. All of these organs are concerned in the preparation of food for absorption,

but do not themselves absorb. Looked at from this standpoint, we have the explanation why the first four inches of the duodenum is associated both in its physiology and pathology with the stomach. The duodenum below the common duct, the jejunum, ileum, cæcum and the colon to the middle of the transverse if not to splenic flexure, is derived from the mid-gut and is concerned in absorption.

Kölling, Cannon and others have demonstrated beyond a doubt that the control of the pyloric apparatus is largely vested in the duodenum. We have reason to believe that to a certain extent this control can be exercised by all of the just named derivations of the mid-gut.

We have seen most marked pyloric spasm giving definite signs and symptoms of supposed mucous ulcer, and upon exploration have found gall-stones or appendicitis, or tuberculosis of the cæcum. On all of these occasions the real seat of the disease was obscured by the stomach symptoms occasioned by the irregular pyloro-spasm. These experiences have been so numerous that we look upon pyloric spasm as an indication of an irritation in some part of the intestinal canal which causes an irregular attempt to close the pylorus and thus prevent food from entering the disturbed area. It can be aptly compared to the miner's sluice canal, the sluice gate being controlled by a pulley. Upon necessity for canal repairs the gate is closed, the disturbance appears at the top where the water is prevented from entering the canal.

We have never seen pyloric spasm in connection with diseases of the terminal portions of the bowel which are derived from the hind-gut. How is this control of the pyloric sphincter brought about? The explanation of this may be found in those splendid experimental studies of the physiology of the digestive tract which have been given to the world by Starling, Pawloff, Cannon and others. Briefly, it would appear that the maintenance of the body is to a large extent independent of the cerebrospinal system.

The stomach is partially controlled by the central nervous system through the effect on this viscus of sight, taste and

smell of food and also by the feeling of repletion which follows the full meal. Intermittent elimination of waste products from the sigmoid and rectum is more or less under conscious control. Through the plexuses of Meisner and Auerbach, acting conjointly with the sympathetic ganglia, the central nervous system has some minor influence on the intervening intestinal tract, but to a large extent the digestive system is still controlled by those primitive chemical messengers which Starling has named "hormones," aided by the sympathetic nervous system.

Hormones are the earliest of all forms of stimulation, and are perhaps the most important agents in the control of digestion. An example is the effect of "secretin" in the stimulation of the pancreatic secretion. Chemical stimulation is undoubtedly the most important factor in the movements of the stomach and intestines, acting as it does directly upon the gastro-intestinal muscle fibre, and is the cause of peristalsis.

The curious blending of the sympathetic with the ductless glands, which produces hormones, is exemplified in the adrenals, thyroids, parathyroids, etc., the products of which have gone under the name of internal secretions. We may here possibly get an explanation of that close association which exists between pyloric spasm, atonic dilatation, prolapse of the stomach and the gastric neuroses which have so often masqueraded as chronic non-indurated mucous ulcer. Be this as it may, the clinical fact remains that for various reasons, operations based upon the belief or actual existence of chronic mucous ulcers, have as a class been unsatisfactory, not that the mortality has been high, but the living through the operation has in a large majority of cases either failed to give relief or has introduced new elements of discomfort.

At the present time we do not consider that a diagnosis of mucous or other undemonstrated ulcer indicates a surgical operation without there exists complications such as perforation, hæmorrhage, or obstruction.